Cell Phone Having Local Wireless Conference Call Capabilities

Field of the Invention

The present invention relates to cellular telephones, and in particular to a cell phone having local wireless conference call capabilities.

Background of the Invention

Cellular telephones, commonly referred to as cell phones have the ability to facilitate three way conference calling. Cell phones are usually on a use plan that involves charges per minute. When a call is placed between cell phones, each phone incurs a per minute charge. When a third cell phone is added to form a three way conference call, the cell phone adding the third cell phone is charged additional minutes, and the third cell phone is also charged minutes, essentially doubling the cost, while only adding one cell phone. In other words, there are four charges for minutes accumulating for a three way call as opposed to only two charges for minutes for a call between two cell phones. In addition, cellular telephone plans commonly limit the number of callers to three in a conference call.

Summary of the Invention

A cellular telephone having a transceiver for making cellular telephone calls is equipped with a second transceiver for establishing communication with other devices having similar capabilities. The cellular telephone uses the second transceiver to establish a local voice channel with another communication device, and combines it with a cellular call to create a multiparty conference call.

In one embodiment, the cellular telephone comprises a mixer to mix voice from the call and local voice channel. The second transceiver implements at least one of many protocols, including RF wireless protocols such as Bluetooth, IR protocols and other line of sight communication protocols, including analog wireless methods.

The cellular telephone also has an input device for selecting transceivers and identifying parties, and a microphone and a speaker coupled to the mixer. In a further

embodiment, the second transceiver automatically identifies other compatible transceivers within range for potential voice channel establishment.

Brief Description of the Drawings

Figure 1 is a block representation illustrating operation of the present invention.

Figure 2 is a block representation of a cellular telephone implementing the present invention.

Figure 3 is a block representation of menu functions available in a user interface of the cellular telephone of Figure 2.

Figure 4 is block diagram of a system for implementing the functions of the present invention.

Detailed Description of the Invention

In the following description, reference is made to the accompanying drawings which form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that structural, logical and electrical changes may be made without departing from the scope of the present invention. The following description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is defined by the appended claims.

A typical cellular communication network is depicted in block form generally at 100 in Figure 1. The network is made up of multiple PBX boxes 110 for switching calls, multiple antennas 120 and 130, and multiple cellular telephones 125 and 135 that communicate to each other through the antennas and PBX boxes in a known manner. There are several different communication protocols used to transmit and receive voice signals between the cellular phones and the antennas. Some cellular phones utilize more than one such protocol, such as an analog and multiple digital protocols. Each cellular phone has one or more cellular transceivers for transmitting and receiving the voice signals.

In the embodiment of the invention shown in Figure 1, cell phone 135 has an additional transceiver therein for establishing communications with a local device separate from the cellular phone network. This additional, or local transceiver does not utilize the cellular phone network, but instead relies upon a local area communication protocol, such as Bluetooth, IR, RF, or other wireless local communication protocol. The local transceiver is used to establish a voice channel with a further device 140 having a compatible local transceiver. The further device 140 is a cellular phone in one embodiment, or a personal digital appliance, computer system, radio, or other device capable of utilizing a local transceiver to transmit and receive voice communications.

In operation, cell phone 135 establishes a cellular telephone call via the cellular network to cell phone 125. This is done in a normal manner, by sending a phone number identifying cell phone 125, and establishing the call when cell phone 125 accepts the call. When the call is established, the second transceiver is used by cell phone 135 to establish a voice channel with device 140. Once this voice channel is established, the sound from both the cellular call, and the voice channel are mixed and provided to each transceiver for transmission. In essence, a multiparty conference call has been initiated by a cellular phone without incurring additional toll charges with the addition of a third party.

Figure 2 is a block diagram of a cellular telephone 135 implementing the present invention. An I/O and controller device 210 comprises standard keys found on a cellular telephone and a multi-line display for providing information such as caller ID information, and menu selection choices. Additional keys are provided in one embodiment for functions specific to establishing the voice channel using the local transceiver, or such functions are accessible through menu navigation. In still further embodiments, voice activation is used to access such functions. Device 210 also comprises a software driven controller for controlling functions of the cellular telephone.

Device 210 is coupled to a cellular transceiver 220 and a local transceiver 230, which operate under control of the device. As indicated above, the cellular transceiver is used to send signals to and from a remote cellular antenna to establish a cellular telephone call. The local transceiver is used to establish a local voice channel with a nearby second device similarly equipped with a local transceiver. The transceivers are both coupled to a mixer 240, which is either a software based mixer, hardware, or

combination of software and hardware. In one embodiment, a software for mixing voice from both transceivers is executed on a processor that is located in device 210, or some other device on a circuit board within the cellular telephone. Mixer 240 is coupled to a local speaker 250 and microphone 260 for use by a user of the cellular telephone 135. Sounds such as voice, generated by the user of the cellular telephone 135 are mixed with sounds from the other devices and transmitted to such devices, as well as speaker 250 for the user of cellular telephone 135. In one embodiment, the sound generated by one device is not fed back to the speaker of that device. In other words, mixer 240 does not mix sound generated at microphone 260 and play such sound at speaker 250. In further embodiments, sound or voice generated by a user is optionally modified or not modified and fed back to the user through the corresponding speaker if desired.

Local transceiver 230 is capable of establishing multiple local voice channels if desired. Local transceiver 230 implements a communication protocol selected from the group consisting of RF, IR and microwave based communication protocols, or yet further wireless communication protocols. Depending on the protocol implemented, other nearby devices join in on the same voice channel, or a different voice channel to create a conference call involving more that three people, and including a cellular telephone call. Mixer 240 is designed to mix multiple channels in a known manner.

The local transceiver as controlled by device 210 automatically identifies other compatible transceivers within range for potential voice channel establishment in one embodiment. In one embodiment, the local transceiver 230 broadcasts a request for each suitable device within range to identify themselves. The user of the cellular telephone then selects the user from a list on the display of the telephone.

In further embodiments, an identifying code is provided by a user of another local device, and the other local device is asked to join in the conference. Upon acceptance by the other local device, a multiparty conference call is established. It should be noted that the order in which parties are added to a conference call is variable. The local voice channel is established prior to a cellular call in one embodiment.

Device 210 also contains software for generating a menu driven user interface for display on the display of the cellular telephone. A block diagram representative of such functions is provided in Figure 3. Cellular call functions are provided at one level of the

menu as indicated at 310. Such functions need not be modified from those commonly associated with cellular telephones, and commonly include the ability to initiate cellular telephone calls, although initiation of such calls is usually accomplished by pressing numbered keys and a send key. A phone book set of functions 320 is also provided, along with a settings set of functions. The number of such functions in nested menus is unlimited, and the blocks are not intended to specify any order or relationship between such functions.

Sets of functions for use of the second transceiver are represented by and under block 340. Again, the functions comprise sets of nested functions in one embodiment. A menu is provided in one embodiment at 350 identifying compatible devices within range. Identification codes of such devices are preprogrammed into the cellular telephone in one embodiment, with the user of the phone associating a name of a person with each device. In further embodiments, a function provides the ability for the user to enter in a code for a user, or receive a request from another user to initiate a voice channel. Such functions are represented by block 360. Also included are menus for adding voice channels and cellular calls into a conference. The menu provides a list of potential callers to add, and provides the ability to select desired callers in one embodiment. In another embodiment, standard keys on the telephone are used in the same manner as normally used on cellular telephones to add parties to the call.

Device 220 in one embodiment is essentially a computer system 400 as identified in a simplified block diagram of Figure 4. The further devices are also based on the same architecture in one embodiment. In further embodiments, device 220 and further devices 140 are formed with firmware or hardware based controllers.

Computer system 400 comprises a system board 415 having a memory device 410 on which programs are stored, for execution on a processing unit 405. The memory 410 comprises system memory, volatile memory and non-volatile memory. Processing unit 405 comprises a standard processor commonly used in personal computers, or other type of firmware or hardware. Computer system 400 further comprises removable storage 420, non-removable storage 425, output devices 430 and input devices 435, corresponding to the display and keyboard of the cellular telephone, and communication devices 440, corresponding to the transceivers. As can be seen, the simplified

architecture of the cellular telephone is very similar to that of a computer system in one embodiment. As previously indicated, the cellular telephone is simplified further by having just non-volatile memory from which a processor executes specialized code to control the functions of the cellular telephone.

The I/O and controller device 220 performs several functions as identified above. Such functions are implemented in software in one embodiment, where the software comprises computer executable instructions stored on computer readable media such as memory 410 or storage devices 420 and 425. The term "computer readable media" is also used to represent carrier waves on which the software is transmitted.